CASE REPORT

Aspiration Pneumonia Caused by Neuromyelitis Optica in a Patient with Suspected COVID-19

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Abstract: Neuromyelitis optica spectrum disorder (NMOSD) is an idiopathic autoimmune inflammatory disorder which is characterized by central nervous system (CNS) demyelinating. Common symptoms of area postrema clinical syndrome (APS) include intractable hiccup, nausea and vomit which may lead to aspiration pneumonia. In this article, we report a patient with suspicious COVID-19 infection and complicated with NMOSD and aspiration pneumonia. The question still remains that whether 2019-nCoV could infect CNS and cause NMO.

Key words: Neuromyelitis optica; Aspiration pneumonia; COVID-19

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Neuromyelitis optica spectrum disorder (NMOSD) is an idiopathic autoimmune inflammatory disorder which is characterized by central nervous system (CNS) demyelinating. The clinical features of NMO are optic neuritis, acute myelitis and area postrema clinical syndrome (APS) caused by medulla lesion. Common symptoms of APS include intractable hiccup, nausea and vomit which may lead to aspiration pneumonia. In this article, we report a patient with suspicious COVID-19 infection and complicated with NMOSD and aspiration pneumonia. The question still remains that whether 2019-nCoV could infect CNS and cause NMO.

Case study

A 53-year-old woman presented to our hospital in February 2020 for the presence of fever along with cough and expectoration. She caught a chill 6 days before and then she begun to have fever, cough with small amounts of sticky yellowish-white phlegm which was hard to cough out. She also suffered from fatigue, nausea, vomiting and blurred vision and the condition was aggravated. The patient was a resident of Hubei province, China, which was acknowledged as the affected area of coronavirus disease 2019 (COVID-19) [1]. In January 2020, the patient flew to Hainan province where there were few outbreaks. Patient had a history of reflux esophagitis and duodenal ulcer.

On examination, the temperature was 38.6°C, the blood pressure 130/70 mmHg, the pulse 120 beats per minute, the respiratory rate 21 breaths per minute, the oxygen saturation 68% while the patient was breathing ambient air and the oxygen saturation 99% while she was administrating oxygen 5L per minute. Auscultation revealed coarse lung breath sound and discreet moist

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rales in bilateral base lung. The remaining physical examination was within the normal limitation.

Laboratory analysis at hospital admission revealed leukocyte count 13.46*10^9/L with 97.6% neutrophils and 1.9% lymphocytes. C-reactive protein level was at 100.4 mg/L, procalcitonin of 0.920ng/ml and interleukin-6 of 491.70pg/ml. Arterial blood gas analysis showed that partial pressure of oxygen was 39 mmHg, partial pressure of carbon dioxide was 62mmHg and pH value was 7.31. RT-PCR test was performed 3 times with all negative results of 2019-nCoV. But on February 28th 2019-nCoV antibody test revealed IgG level at 1670.0 mg/dl and IgM of 52.7mg/dl. Patient underwent laboratory tests in succession during the whole course and the test data are shown in Table 1.

Table 1 The laboratory results of the patient

Item	Feb. 28th	Mar. 2nd	Mar. 6th	Mar. 13th	Mar. 19th	Mar. 25th
Leukocyte (10^9/L)	11.51	16.05	5.90	6.17	6.44	5.25
Lymphocyte (10^9/L)	0.06	0.019	0.039	0.1	0.219	0.37
C-reactive protein (mg/dl)	10.04	6.6	0.5	3.74	0.78	3.24
Procalcitonin (ng/ml)	0.92	0.459	0.279	0.088	0.077	0.037
IL-6 (pg/ml)	491.7	48.89	2.85	20.16	17.14	6.65
D-Dimer (ng/ml)	3726	19762	1412	1543	1073	830
nCOV	(−)	(−)	(−)	(−)		
IgG (mg/dl)	1670		1270	1040	1270	1220
IgM (mg/dl)	52.7		81.9	61.3	75.1	69.33

Reference range: Leukocyte, 3.5-10; Lymphocyte, 0.20-0.40; C-reactive protein, 0-0.5; Procalcitonin, < 0.5; IL-6, 0-7; D-dimer, < 500; IgG, 700-1600; IgM, 40-230.

Lung ultrasound at admission showed multiple B3-lines in bilateral lung, particularly in 4th-6th zones both side (according to the six BLUE-points [2]). These B3-lines integrated into “white lung”. Diffuse atelectasis appeared and mild pleural effusion was observed in bilateral costophrenic angle (Fig. 1). She had routine ultrasound for follow-up assessment which recorded her improvement: including that confluent B3-lines gradually reduced to disappeared, B7-lines arose, diffuse atelectasis centralized to 4th-6th zones and lessened to vanished. Eventually, A-lines arose in 12 zones of bilateral lung, pleural effusion disappeared and lung sliding sign seen. The remaining findings of other organs were unremarkable.

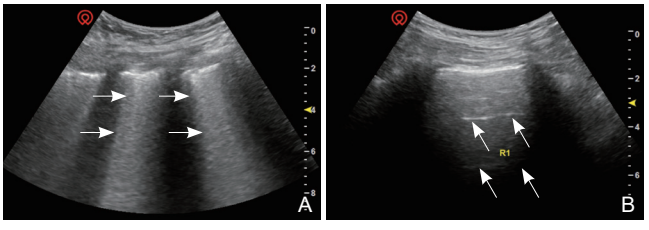

Figure 1 The tele-ultrasound images of the lung. (A) On the first day in the hospital, the lung ultrasound revealed multiple B3-lines (arrows) in bilateral lung particularly in 4th-6th zones and fused to “white lung”. Diffuse atelectasis appeared; (B) On the 24th day in the hospital, the lung ultrasound revealed multiple A-lines (arrows) appeared in bilateral pulmonary areas, pleural effusion disappeared.

Chest computed tomography (CT) at admission showed diffuse lesions of bilateral lung with appearance of patchy high-density shadow, ground-glass opacity and consolidation with obscure margin. Air bronchogram appeared. Repeated chest CT on March 8th showed an obvious alleviation of the pulmonary infection (Fig. 2).

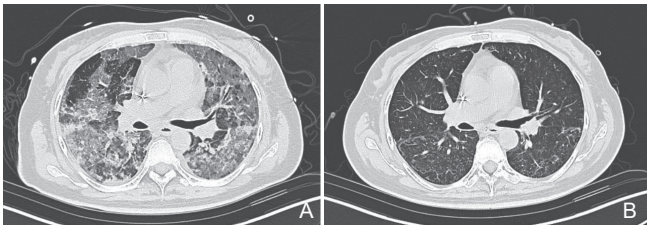

Figure 2 Chest CT images. (A) On the first day in the hospital, the CT images showed patchy high-density shadow, ground-glass opacity and consolidation with obscure margin. Air bronchogram appeared; (B) On the 24th day in the hospital, the CT images showed an obvious alleviation of the pulmonary infection.

Brain magnetic resonance (MR) imaging were performed 7 days after hospital admission because the decrease of left muscles strength and aggravation of blurred sight occurred. Brain MR imaging showed mottled long T1 and slight long T2 signal intensities at dorsal medulla where diffusion weighted imaging (DWI) showed a high signal. Besides, there were patchy slight long T2 signal intensities at the white matter of the

left frontal lobe. Coronal T2 fluid attenuated inversion recovery (FLAIR) imaging showed a high signal on bilateral optic nerve. Repeated brain MR imaging on March 11th showed small patchy long T1 and slight long T2 signal intensities at dorsal medulla where diffusion weighted imaging (DWI) showed a high signal with blurred margin. MR enhanced scanning suggested that the punctiform signals were obviously intensified. Coronal T2 FLAIR imaging showed a reduction of the high signal at intraorbital optic nerve.

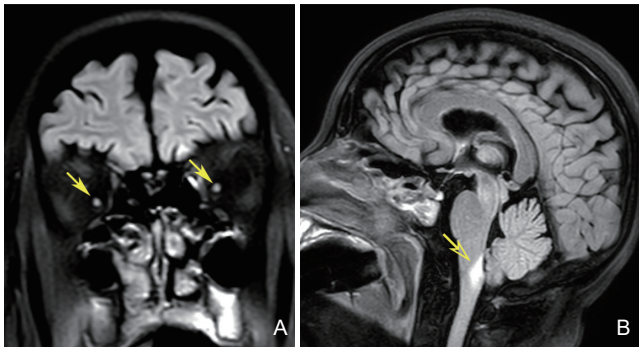

Figure 3 Coronal and sagittal T2 fluid attenuated inversion recovery imaging demonstrated the high signal on the bilateral optic nerves (solid arrows) and area postrema (empty arrow), respectively.

Tracheal intubation was performed and the patient put on a ventilator immediately after the situation progressed to respiratory failure. Associated evidences suggested a pulmonary infection although the pathogen remained uncertain. Because patient had 2019-nCoV IgG positive and possible contact with the infectious source, 2019-nCoV infection could not be excluded. Thus, the patient was isolated and received symptomatic treatments including anti-infection, hormonotherapy, γ-globulin therapy, CRRT, sputum suctioning and lavage trachea. Endotracheal aspiration in February 29th showed thick white secretions and plant-like green substances. Aspiration pneumonia was considered since COVID-19 RT-PCR test and antibody test of throat swab, sputum suction content and anal swab were performed continuously during this period with all negative results. After a series of sustaining treatments, her pneumonia associated symptoms and signs were improved. When brain MR imaging confirmed the diagnosis of NMO, the patient began to receive plasma exchange, neurotrophic treatment and other NMO treatments until the neurology symptom relieved.

Discussion

COVID-19 drew global attention because of the rapidly increasing numbers of new cases [1]. Majority of COVID-19 cases have a history of contact with the infection source. The clinical manifestation are fever, dry cough and fatigue. Critical patients undergo rapid disease progression which are likely to develop into sever pneumonia, dyspnea and/or hypoxemia [3].

Imaging manifestation of COVID-19 include: (1) Chest CT imaging of sever COVID-19 features diffusion lesions with blurred margin of bilateral lung. Nidus began with nodules and patches and soon developed into solid intensities. Large-scale consolidation and air bronchogram are common findings [4,5]. In this case, prime chest CT showed diffuse lesions of bilateral lung where there were patchy high-density shadow, ground-glass opacity and consolidation with obscure margin along with air bronchogram. These nonspecific presentations are difficult to differentiate clinically [6]. (2) Though lung ultrasound serves as unconventionality examination for pneumonia, ultrasound endows nature advantages of convenience, real time, point-of-care and telemedicine, which makes sense for isolated patients. Now the COVID-19 comes to an outbreak, portable ultrasound can play an important role not only for making diagnosis and follow-up, but also for guiding the interventional procedures. Meanwhile, telemedicine of ultrasound can effectively reduce the epidemic spread between patients and medical staffs. Prime lung ultrasound of this case showed multiple B3-lines in bilateral lung and diffuse subpleural atelectasis which are typical viral pneumonia manifestation but nonspecific for COVID-19 [7].

Screenings for COVID-19 are mainly based on patients' epidemiological character and clinical syndrome. This case has evidence to contact the affected area and typical syndrome of fever and respiratory symptoms. In addition, the imaging studies showed appearances of a severe pneumonia. These findings meet the diagnostic criteria for suspected COVID-19 [3]. However, the definite diagnosis for COVID-19 needs etiological or serological evidence. When it comes to this case, although COVID-19 RT-PCR test and antibody test of throat swab, sputum suction content and anal swab were performed continuously during this period with all negative results, this patient still has possible infection of 2019-nCoV because the pathological process are not clearly understood yet, and laboratory detection path have not been standardized in its earlier stage of epidemic. Therefore, suspected cases with negative COVID-19 RT-PCR test should be treated with cautious [8]. In this case, 2019-nCoV antibody test revealed IgG positive at hospital admission and COVID-19 could not be excluded. Thus, to prevent further spread, the whole staffs abided strictly by the technical guidelines on prevention and control of novel coronavirus infection in medical centers [9].

NMO is an idiopathic autoimmune inflammatory disorder which is characterized by central nervous system (CNS) demyelinating [10-12]. The etiology is related to Aquaporin-4 antibody (AQP4-IgG). NMO is an independent entity which is different from multiple sclerosis (MS) [13,14]. The clinical features of NMO are

optic neuritis (NO) and longitudinally extensive transverse myelitis (LRTM). In this case, patient had an aggravation of neurological symptom, and the MR imaging suggested extensive involvement including dorsal medulla, left frontal lobe and intraorbital optic nerve. According to the international consensus diagnostic criteria for neuromyelitis optica spectrum disorders [15], this case had three core clinical symptoms which are optic neuritis, acute myelitis and area postrema clinical syndrome (APS). The brain lesions were spatial multiple and the MR imaging conformed to the additional requirements. The diagnosis of NMO is confirmed except for tumor, metabolic disease and other factors.

Common symptoms of APS include intractable hiccup, nausea and vomit with an incidence of 16%-43% [15]. Associated lesion area is postrema of dorsal medulla, which participates the coordination of vomit [16,17]. Dorsal medulla damage can affect solitary nucleus and cause throat paresthesia. Therefore, APS easily causes aspiration pneumonia. In this case, aspiration pneumonia is likely induced by NMO.

Conclusion

We describe the case of an elderly female patient with NMO complicated by suspected COVID-19. Throughout the entire course of this case, we concluded that: (1) Timely isolation and treatment of suspicious patient make sense at specific periods of epidemic outbreak. (2) Once the diagnosis of NMO was confirmed, the following treatments took evident effect. (3) Ultrasound played an important role in dynamic assessment of pneumonia for guiding treatment. (4) In term of etiology, we could not definitely exclude 2019-nCoV infection since there was still probability for false-negative results. The question still remains that whether 2019-nCoV could infect CNS and cause NMO like other viruses such as human papilloma virus and helicobacter pylori [18].

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Conflict of Interest

The authors have no conflict of interest to declare.

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